



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/020,813	12/12/2001	Srinivasan Chakravarthi	TI-33161	8922
23494	7590	01/07/2004	EXAMINER	
TEXAS INSTRUMENTS INCORPORATED P O BOX 655474, M/S 3999 DALLAS, TX 75265			HUYNH, YENNHU B	
			ART UNIT	PAPER NUMBER
			2813	

DATE MAILED: 01/07/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No.	Applicant(s)
	10/020,813	CHAKRAVARTHI ET AL.
	Examiner	Art Unit
	Yennhu B Huynh	2813

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

1) Responsive to communication(s) filed on 07 January 2003.

2a) This action is FINAL. 2b) This action is non-final.

3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

4) Claim(s) 1-7 is/are pending in the application.

4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.

5) Claim(s) \_\_\_\_\_ is/are allowed.

6) Claim(s) 1-3 and 5 is/are rejected.

7) Claim(s) 6 & 7 is/are objected to.

8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

9) The specification is objected to by the Examiner.

10) The drawing(s) filed on \_\_\_\_\_ is/are: a) accepted or b) objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. §§ 119 and 120

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a) All b) Some \* c) None of:

1. Certified copies of the priority documents have been received.

2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.

3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

13) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) The translation of the foreign language provisional application has been received.

14) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

#### Attachment(s)

1) Notice of References Cited (PTO-892) 4) Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_ .

2) Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) Notice of Informal Patent Application (PTO-152)

3) Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_ . 6) Other: \_\_\_\_\_

## DETAILED ACTION

This Office Action is in response to the Amendment B filed on 10/6/03.

### ***Information Disclosure Statement***

The information disclosure statement is being considered by the examiner.

### ***Oath/Declaration***

Oath/Declaration filed on 12/12/01 is acceptable.

### ***Specification***

Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Maszara et al. (U.S. 6,362,063B1).

Maszara et al. at figs. 1-4 in related text cols. 1-10 disclose formation of a shallow junctions for semiconductor device, which include:

-Re. claims 1-3 & 5: forming a coating comprising a boron dopant over a surface 102 of a single crystal silicon semiconductor substrate 100 (cols.2, 3 & 4 lines 55-6); heating the semiconductor substrate to cause a portion of the dopant to diffuse from the

Art Unit: 2813

coating into the semiconductor substrate and thereby form a P-N junction within the semiconductor substrate (col. 4 lines 7-49), prior heating the single crystal comprises a semiconductor that forms the majority of impurity atom fluoride in BF<sub>2</sub> (col. 1, lines 61-65 and fig. 3C, col.6, lines 49-51); wherein the impurity atom has a dose of 1-9x10<sup>14</sup> atoms/cm<sup>2</sup> within the layer; wherein the semiconductor substrate has an interstitial form that similar to amorphous form and is distributed primary within the layer 102 of the crystal adjacent (106) the surface (fig. 1B, col.4, lines 14-18); and at 1000 C degrees increasing the activation and diffusion of the species to the single crystal silicon substrate (col.4, lines 47-58).

However, Maszara et al. do not disclose wherein the impurity atom has a dose of at least about 1x10<sup>13</sup> atoms/cm<sup>2</sup>, or at least about 1x10<sup>14</sup> atoms/cm<sup>2</sup> within the layer, even though Maszara disclose the impurity atom has a dose of at least about 5x10<sup>14</sup> atoms/cm<sup>2</sup> (col.6, lines 47-57).

The range of dosage of the impurity atoms is considered to involve routine optimization while has been held to be within the level of ordinary skill in the art, As noted In re Aller 105 USPQ233, 255 (CCPA 1955). the selection of reaction parameters such as temperature and concentration would have been obvious.

"Normally, it is to be expected that a change in temperature, or in range, concentration, cycles, thickness, would be an unpatentable modification. Under some circumstance, however, changes such as these may be impart patentability to a process if the particular ranges claimed produce a new and unexpected result which is different in kind and not merely degree from the results of the prior art ... such ranges are termed "critical ranges and the applicant has the burden of proving such criticality ... More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller 105 USPQ233, 255 (CCPA 1955). See also In re Waite 77 USPQ 586 (CCPA 1948); In re Scherl 70 USPQ 204 (CCPA 1946); In re Irmscher 66 USPQ 314 (CCPA 1945); In re Norman 66 USPQ 308 USPQ 308 (CCPA 1945); In re Swenson 56 USPQ 372 (CPA 1942); In re Sola 25 USPQ 433 (CCPA 1935); In re Dreyfus 24 USPQ 52 (CCPA 1934).

Maszara et al. also disclose:

-Re. claim 4: wherein after heating most of the dopant that has diffused into the semiconductor substrate is located within about 50nm from the surface of the semiconductor substrate (col.3 lines 7-29 and col.4 lines 23-24).

***Allowable Subject Matter***

Claims 6 & 7 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is an examiner's statement of reasons for allowance: None of prior art disclose or suggest fabrication of ultra shallow junctions from a solid source with fluorine implantation, which include the steps of after heating the concentration of the dopant within the substrate is at least about  $1 \times 10^{19}$  atoms/cm<sup>3</sup> (cl.6); and wherein the coating dopant containing glass layer on a semiconductor surface (cl.7).

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

***Pertinent Prior Art***

Toshihiro (JP 3135030A) disclose a semiconductor device and manufacturing.

The process includes a single crystal semiconductor substrate 2, dopant to form PN junction in the substrate, and impurity fluorine in the semiconductor substrate to reduce the number of free bonds and increase current. This reference is deemed to relevant to the current invention.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Yennhu B Huynh whose telephone number is 703-308-6110 (and the new telephone number will be effected from 2/5/04). The examiner can normally be reached on 8.30AM-7.00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr., can be reached on 703-308-4940. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-7724.

Yennhu Huynh  
Examiner  
12/26/03

